Aster
Module for DAB / FM - RDS

User Manual

Revision: 0.2

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Revision History

Version	Date	Description
0.1	August 19, 2008	Created
0.2	September 16, 2008	Add Application mode

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1 General Description

The Viaon Aster multi-standard Digital Radio module for consumer products comprises a multi-band RF tuner, a baseband processor and provides decoded audio output. The Aster could support DAB with DLS and FM with RDS function (EPG is optional).

The Aster can be used as a master device, running a customizable user interface and directly interfacing to displays and buttons or as a slave device using UART, I2C or SPI control interfaces.

1.1 Features

Radio features

- ✓ DAB ETSI EN 300 401 standard compliant
- ✓ Support all DAB Transport Mode I, II, III and IV
- ✓ DAB Band III reception
- ✓ DAB L-band reception
- ✓ FM with RDS reception
- ✓ Sensitivity better than -100dBm
- ✓ Single combined antenna for DAB/FM
- ✓ DAB Dynamic reconfiguration supported
- ✓ Customizable User interface
- ✓ Digital radio Rewind ☐
- ✓ Electronic Program Guide (DAB) ☐
- ✓ Real-time clock with on-board battery / capacitor back-up

Interfaces (☐ Option)

- ✓ IR Remote Control
- ✓ Stereo analogue audio output
- ✓ S/PDIF digital audio output
- ✓ UART interface
- ✓ External serial (I2C) control ☐
- ✓ External serial (SPI) interface ☐
- ✓ I2S digital audio output ☐

1.2 Applications

- ✓ Mains and portable DAB Radio
- ✓ Clock and Kitchen Radio
- ✓ HiFi Receivers
- ✓ CD Micro Systems
- ✓ Boom-boxes
- ✓ Car Radio

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2 System Architecture

2.1 Functional Block Diagram

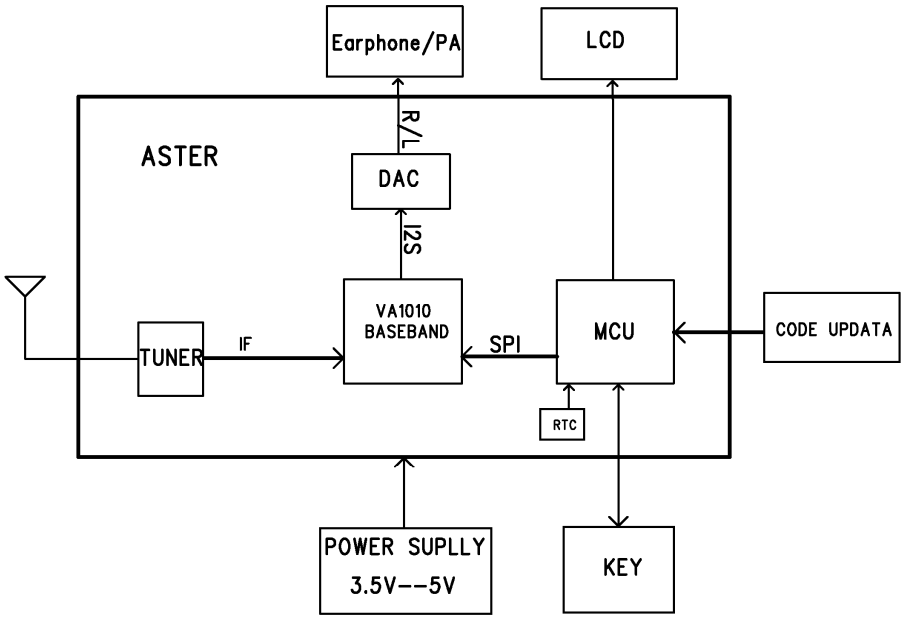

Figure 2-1 Functional Block Diagram

2.2 Hardware Overview

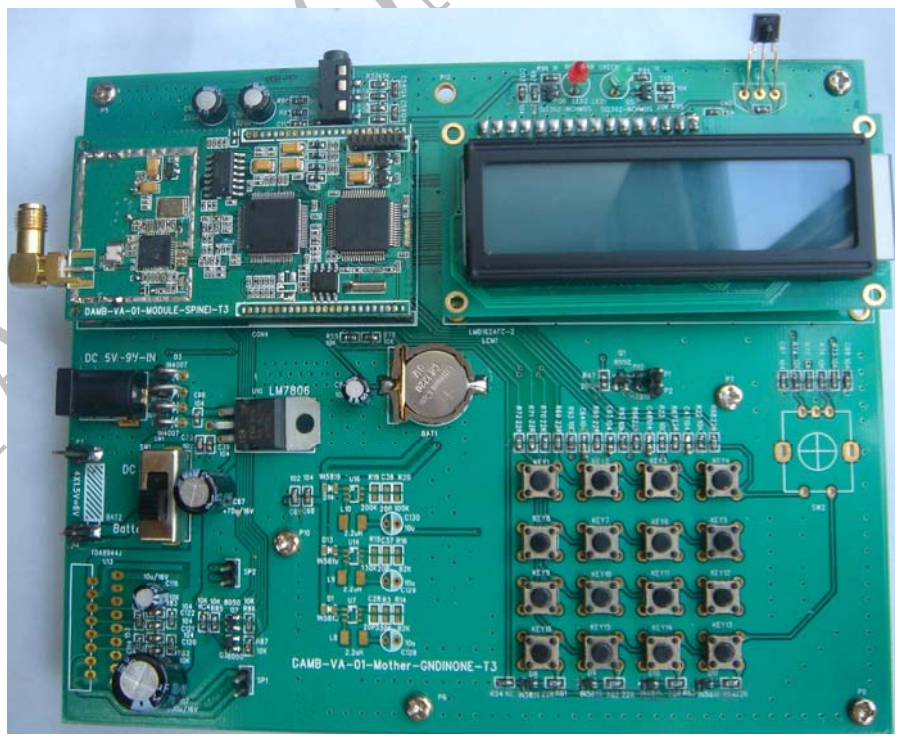

Figure 2-2 Aster Module and Motherboard Overview

3 Pin Table

Table 3-1 Pin Description

Pin	Symbol	Type	Description
1	PC10	I/O	I/O: (DAB/FM Status Indicator)
2	PC11	I/O	I/O (LCM RS)
3	PC12	I/O	I/O (LCM RW)
4	PB8	I/O	I/O (KEY SCAN)
5	PB9	I/O	I/O (KEY SCAN)
6	RTC VBAT	PWR	RTC POWER SUPPLY
7	PC13	I/O	I/O (EARPHONE INSERT DETECT)
8	PC0	I/O	I/O (LCM DATA0)
9	PC1	I/O	I/O (LCM DATA1)
10	PC2	I/O	I/O (LCM DATA2)
11	PC3	I/O	I/O (LCM DATA3)
12	PA0	I/O	I/O(KEY INTERRUPT, MCU WAKE UP)
13	PA1	I/O	I/O (KEY TONE OUT)
14	PC4	I/O	I/O (LCM DATA4)
15	PC5	I/O	I/O (LCM DATA5)
16	PB0	I/O	I/O(AD IN)
17	PB1	I/O	I/O
18	PB10	I/O	I/O(KEY SCAN)
19	PB11	I/O	I/O(KEY SCAN)
20	PB12	I/O	I/O(KEY SCAN)
21	PB13	I/O	I/O(KEY SCAN)
22	PB14	I/O	I/O(KEY SCAN)
23	PB15	I/O	I/O(KEY SCAN)
24	PC6	I/O	I/O (LCM DATA6)
25	POWER INA	PWR	LDO POWER INPUT
26	PC7	I/O	I/O (LCM DATA7)
27	PC8	I/O	I/O (LCM CHIP SELECT)
28	PC9	I/O	I/O (LCM BACKLIGHT ENABLE)
29	GND	GND	GND
30	GND	GND	GND
31	3.3V	PWR	3.3V OUTPUT
32	1.8V	PWR	1.8V OUTPUT
33	PA10	I/O	I/O: UART INPUT SIGNAL
34	PA8	I/O	I/O: (IR RECEIVER)
35	PA9	I/O	I/O: UART OUTPUT SIGNAL
36	PA11	I/O	I/O
37	PA12	I/O	I/O
38	PD2	I/O	I/O: (DAB/FM STATUS INDICATOR)
39	PB5	I/O	MODULE DAC ENABLE
40	DAC ROUT	O	R-CH ANALOG AUDIO OUTPUT (NO BLOCKING CAP)
41	GND	GND	GND

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42	GND	GND	GND
43	DAC LOUT	O	L-CH ANALOG AUDIO OUTPUT (NO BLOCKING CAP)
44	SPDIF OUT	O	DIGTAL AUDIO S/PDIF OUTPUT
45	RF3.3V	PWR	LNA3.3V POWER OUTPUT
46	POWER INB	PWR	RF LDO POWER INPUT
47	GND	GND	GND
48	GND	GND	GND

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4 Interfaces

4.1 Keypad:

4x4 key scan matrix, up to 16 keys; supports button push/release, long push, push-hold, etc.

4.2 Rotary Encoder:

Provide one rotary encoder.

4.3 IR remote control:

Compatible with the popular NEC standard IR protocol.

4.4 LCM Display:

2-line x 16 character format LCM, supports Latin character display (Character set depending on the LCM model).

4.5 Audio Output:

On-board audio DAC with stereo analogue line output;
Digital audio output - S/PDIF

4.6 RTC:

MCU embedded RTC could support clock and alarm functions.

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5 Operation Flow

5.1 System Architecture:

The input to the Aster is the broadcasted RF signal received by the antenna. The output is a demodulated, selected channel stream in the format of either MPEG transport packets or IP datagrams (depending on the standard).

5.2 Firmware Upgrade:

The Aster is designed to offer several choices for firmware program and upgrade:

1. **JTAG Port:** Used to download programs to system FLASH memory and for JTAG debuggers. A Cable is included that connects a desktop PC serial port. Software is also provided.

2. **UART Port:** Using this method customer need to change the boot sequence of the MCU firstly.

5.3 Master and slave mode description:

The Aster could be applied to Master mode and two types of Slave mode (Pin compatible with different modes application).

5.3.1 Master Mode

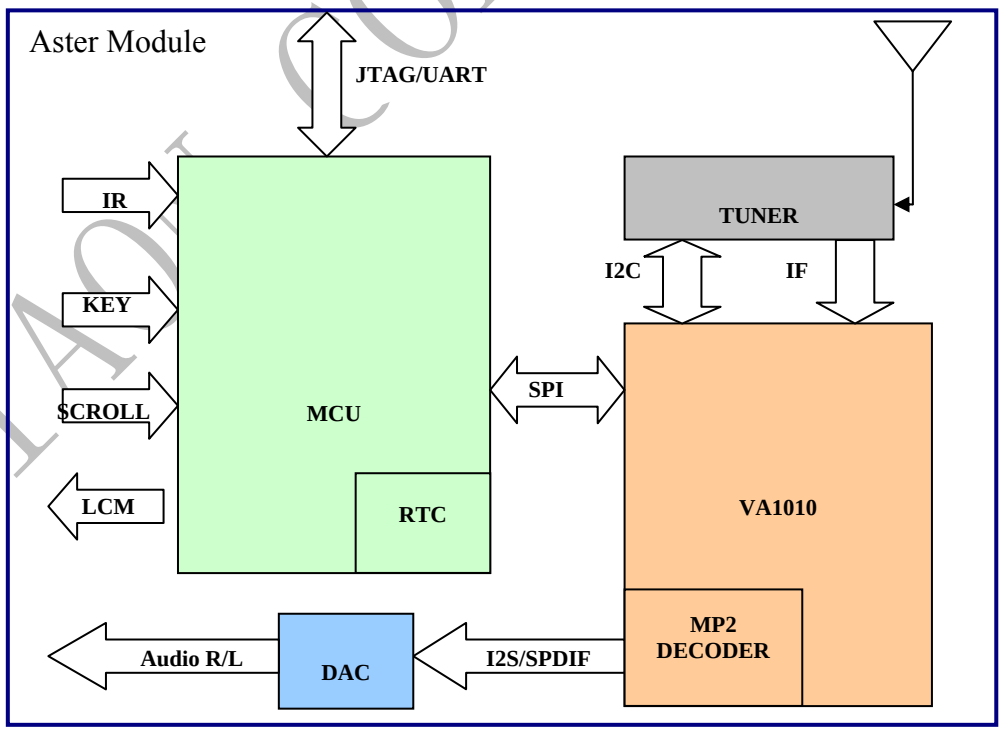

Figure 5-1 Aster System Architecture Diagram (Master Mode)

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5.3.2 Slave Mode (With MCU onboard)

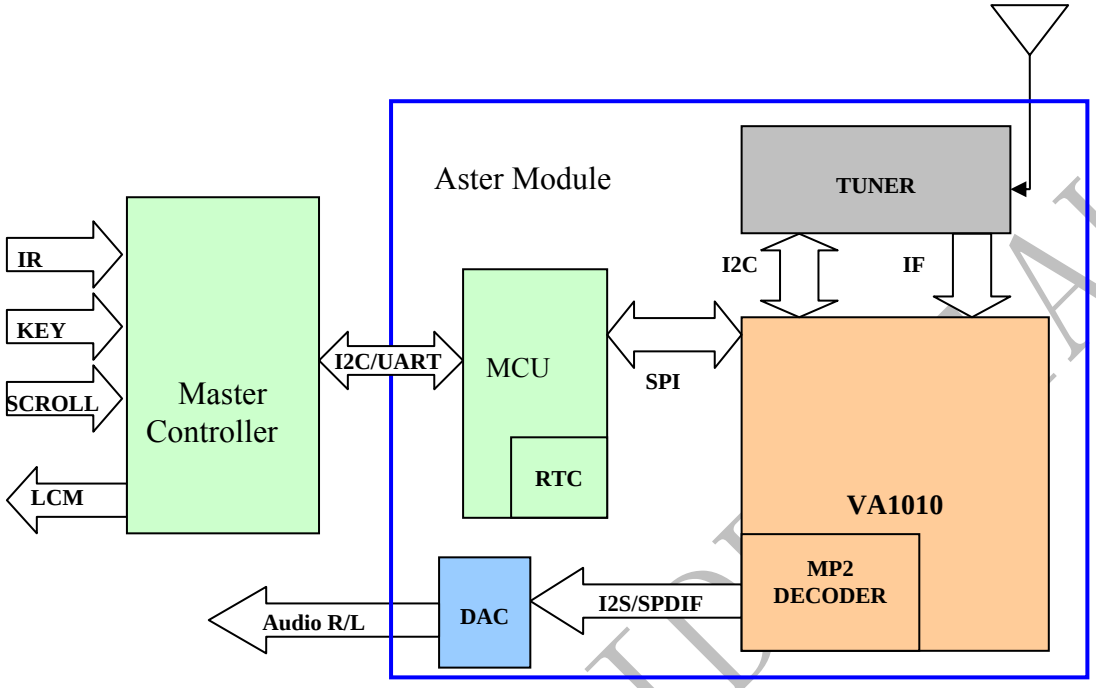

Figure 5-2 Aster System Architecture Diagram (Slave Mode with MCU onboard)

5.3.3 Slave Mode (Without MCU onboard)

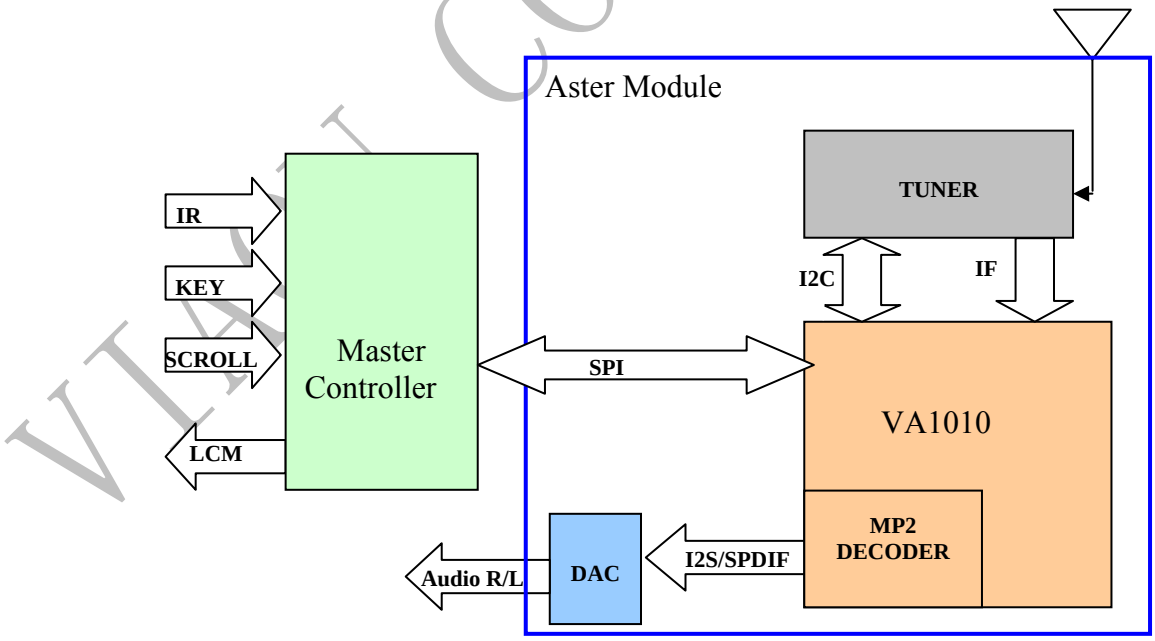

Figure 5-3 Aster System Architecture Diagram (Slave Mode without MCU onboard)

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6 Application Schematic

Please refer to the attachment.

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7 Electronic Parameters

Table 7-1 Performance Specific

Specifications					
Parameter	**Condition**	**Min**	**Typical**	**Max**	**Unit**
Input Impedance	VHF and L-Band Antenna connection points		50		Ω
FM (with RDS) Operation					
RF Frequency Range	(S+N)/N = 26dB	87.5		108	MHz
Sensitivity (30dB Quieting)	89MHz		2		dBuV
	98MHz		2		dBuV
	106MHz		2		dBuV
RF Sensitivity	S/N=26dB		0		dBm
Large Signal Handling Capacity	98MHz 60dBuV		-13		dBm
(S+N)/N			50		dB
THD	Deviation 22.5kHz		0.4		%
Difference R/L			0.1		dB
Maximum Output Level(mod=75kHz) RMS			0.6		V
Current Consumption			180		mA
DAB Band III Operation					
RF frequency Range		174		240	MHz
Sensitivity 174.928MHz	Measurement to EN50248		-100		dBm
Sensitivity 206.352MHz	Measurement to EN50248		-100		dBm
Sensitivity 237.488MHz	Measurement to EN50248		-100		dBm
Maximum Input Signal for a BER of 10-4			0		dBm
Frequency Grid			1		KHz
(S+N)/N	209.936MHz -72dBm		89		dB
THD	Deviation 22.5kHz		0.03		%
Separation R/L			58		dB
Separation L/R			58		dB
Difference R/L			0.1		dB
Maximum output level RMS			0.68		V
Current Consumption			180		mA
DAB L-Band Operation					
RF Frequency Range		1452		1492	MHz
Sensitivity 1452.960MHz	Measurement to EN50248		-97		dBm
Sensitivity 1471.792MHz	Measurement to EN50248		-97		dBm
Sensitivity 1490.624MHz	Measurement to EN50248		-97		dBm
Frequency Grid			1		kHz

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IF ADC Precision Supported			10		Bits
(S+N)/N	1471.792MHz\-72dBm		89		dB
THD	1471.792MHz\-72dBm		0.03		%
Separation R/L	1471.792MHz\-72dBm		58		dB
Separation L/R	1471.792MHz\-72dBm		58		dB
Difference R/L	1471.792MHz\-72dBm		0.1		dB
Maximum Output Level RMS	1471.792MHz\-72dBm		0.69		V
Current Consumption			180		mA

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8 Dimensions and Connectors

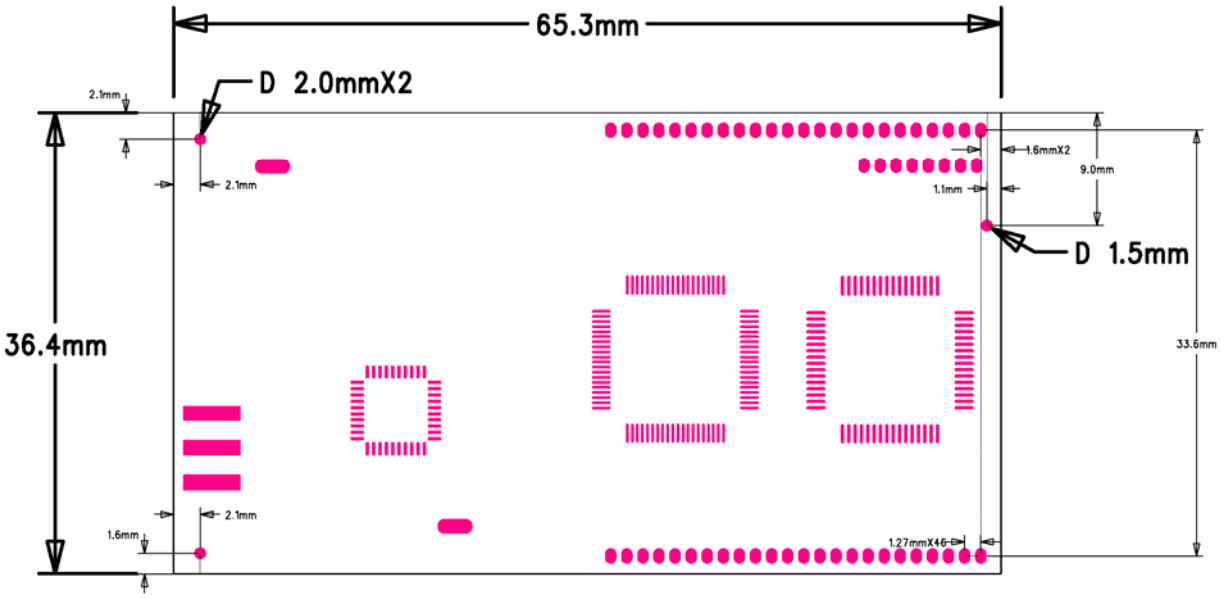

Figure 8-1 Aster Dimension (Top view)

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9 Appendix:

9.1 Module Schematic
9.2 Application Schematic
9.3 Layout Guide (TBD)
9.4 Online-Upgrade User Guide (TBD)

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